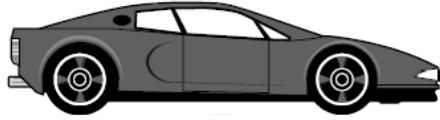


Terminal Velocity

1.

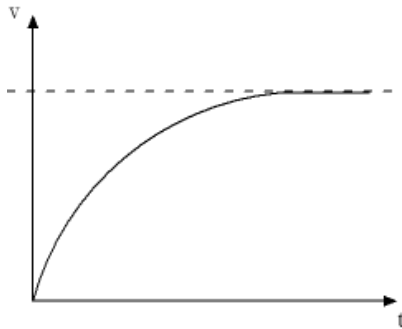
Sam drives his car along a straight, horizontal road. The car starts from rest and accelerates.



The driving force on the car remains constant.

The car's velocity initially increases but eventually becomes constant, despite no change in the driving force.

The following graph shows how the velocity of the car changes during the journey.



Referring to the horizontal forces acting on the car, explain why the velocity of the car increases as shown in the graph and finally becomes constant.

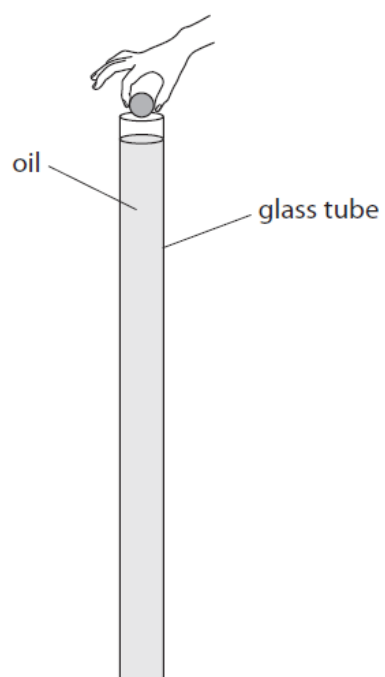
2.

A student investigates terminal velocity.

She uses a tall glass tube filled with oil.

She drops a metal ball into the tube.

The ball falls through the oil.



(a) Use ideas about forces to explain how a falling object can reach a terminal velocity.

(5)

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(b) Describe how the student could find out if the ball reaches terminal velocity as it falls through the oil.

In your answer, you should include

- the measuring instruments that the student will need
- the measurements that she should take
- how she could use her measurements to find out if the ball reached terminal velocity.

You may include a labelled diagram in your answer.

(5)

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3.

A student investigates the motion of different falling masses by measuring the time taken for empty cupcake cases to fall from a window.



(a) The student drops one case from the window.

He repeats the experiment with two cases stuck together, then with three cases and then with four.

Name two measuring instruments that he would need for his investigation.

(2)

1

2

(b) What are the dependent and independent variables in this investigation?

(2)

dependent variable

independent variable

(c) State one factor that the student should keep constant in order to make this investigation valid (a fair test).

(1)

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(d) The student draws this table to record his results.

Add suitable headings to his table.

(2)

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(e) State one way that the student can improve his investigation.

(1)

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(f) The student notices that the cases accelerate and then fall at constant speed.

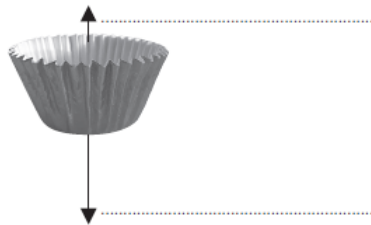
(i) The arrows in the diagrams show the size and direction of the forces acting on a case at different points in its fall.

Label the forces on the middle diagram.

(2)



at the start



part of the way down



near the bottom

(This question continues on the next page)

(ii) Explain why the case accelerates and then falls at constant speed.

(3)

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